

Earth Science

Rockhounds' NATIONAL Magazine

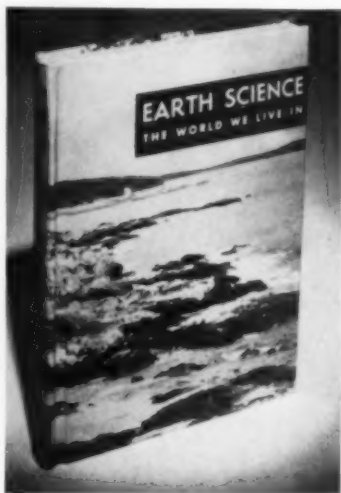


Panning for Gold near Dahlonega, Georgia. (See page 7.)

("If you would like to try panning for gold in this historic spot on your way south to Florida, stop over.")

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Earth Science

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EDITOR'S MEMO PAD

Is interest in your hobby waning? Do you sometimes feel that you need a shot in the arm? Most everybody does, no doubt, at times and this is not at all alarming. It is only a symptom and there is much that can be done about it.

Perhaps you may have gotten into a rut, having gone to seed on some one phase, and are getting well fed up on it, not realizing that there is such a thing as diversity. If this is the case, then it is time to take stock of the situation and to look matters "straight in the eye."

Deviate and/or reverse, is the prescription. If perchance you are one of these individuals that has been only collecting more and more specimens, slow down on the accumulating process before your collection fills your house (and perhaps the basement), literally pushing you out of the door. Start working on what you already have. See that they are properly housed and labeled, or go out and get yourself a lapidary outfit and go to work on them. Learn the joy of "doing with your hands." Thus you may not only renew your interest, but also enhance the value of your collection at the same time.

On the other hand, if you have already polished everything in sight, including the cut glass doorknobs, lay off, perhaps you may need a respite from handwork. Put more effort on some serious study of your specimens. What are they? Why are they? You will find each and every one of them has a most interesting personality as well as a geological history. Minerals like all other things just don't happen by chance, but are all the result of Nature's definite laws, and he who understands them well, must also have a better understanding and respect for their Creator.

Occasionally we hear of miners who go to work in drifts extending out under the ocean, but out in the state of Montana, it is said that some miners living in Butte, after driving some five or six miles out into the country to work, enter the mine and then travel back underground to recover copper ore taken almost directly from under the Post Office.

D. F. Gamble, president of Ward's Natural Science Establishment, Inc., in their current *Natural Science Bulletin* has a timely word to say about preoccupation with pictures and books crowding out laboratory work. He concludes:

"A tradition has gradually built up that science teaching at the secondary school level can be done as well with substitutes as with real materials or equipment. Motion pictures instead of specimens, books instead of nature, teacher demonstration instead of independent laboratory work, and above all, play instead of work. This trend has continued to a point where there are such powerful influences opposed to the laboratory methods of teaching science that it will be very difficult to re-establish it.

"Nowadays we hear much about the 'modern' method of teaching which stresses giving the students 'an introduction into the ways of democracy' and of 'making him a better citizen.' What qualification for citizenship in a democracy can be more important than the ability to think for one's self, and what better place is there for the development of this ability than under the disciplines of the scientific laboratory?"

*

Next Issue

"Geochronology: Science's New Time Clock," by Richard L. Casanova. "... it is possible to measure the amount of radiocarbon left in dead tissue, and thus calculate the time that has elapsed since the death of the given tissue, be it wood, animal or man ... whether it's dating pollen grains removed from the mud of an ancient bog ... or dating Egyptian dynasties."

*

Authors

Ben E. Clement, of Marion, Kentucky, is a widely recognized authority on fluorite. He has kindly furnished us illustrations and supplementary material for the article here used by courtesy of the Earth Science Club of Northern Illinois ... Richard L. Casanova, director, Paleontological Laboratories, Statesville, North Carolina, is a valued past, present and future contributor ... Frank L. Fleener, of Joliet, Illinois, gives for us always interestingly and well of his rich store of knowledge and experience from a lifetime of teaching and study.

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... *Richard M. Pearl* is professor of geology in Colorado College, Colorado Springs. He has written several important books on geological subjects, and was one of the founders and is past president of the American Federation of Mineralogical Societies . . . *Russell P. MacFall*, Wilmette, Illinois, is the author of "Gem Hunters' Guide," written in popular style and one of the most widely distributed books in its field . . . *Laura M. Gradick* is of the Georgia Mineral Society, which under the presidency of Dr. Frank A. Daniel has become one of the largest and most active in the country.

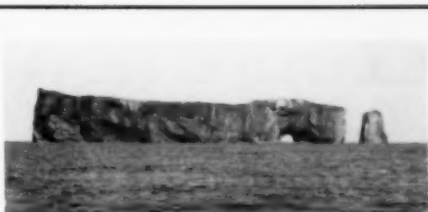
Cover

In the group panning gold near Dahlonega, Georgia, the gentleman next to the pretty girl in the foreground is Dr. George Seward, president of the Georgia Academy of Science. Photograph (by Lt. J. T. Severinghaus, Decatur, Georgia, used by courtesy *Georgia Mineral News Letter*) was forwarded by A. S. Fulcron, Georgia Chief Geologist, who says, "glad to have you use it in your excellent publication."

—BEN HUR WILSON, *Editor*

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Georgia Town Offers Chance To Pan Gold

by LAURA M. GRADICK

MOST FOLKS generally associate gold mining with the far west, but the fact remains that the earliest mining of this precious metal in the United States took place in the State of Georgia, where it was discovered near the ancient town of Dahlonega in the north Georgia mountains early in the 19th century, possibly in 1803.

Today it is still possible to pan for gold, and find some, and many tourists do just that. They don't grow rich, though, for the reason that it costs more to mine the gold "the hard way", than the \$35 an ounce that "Uncle Sam" has set as the legal value. There are, however, no extensive mining operations going on at present, although many small surface mines are being worked.

If you would like to try panning for gold in this historic spot on your way south to Florida, stop over at Dahlonega. It is about 75 miles north of Atlanta on U. S. highway 19 that leads to the Florida west coast.

Anyone will tell you how to contact Bill Trammell who has gold bearing property of his own and will take a party out panning at any time. He has 140 acres in the middle of the gold belt, and will teach you the art of panning for a modest fee (said to be \$1.00) and you may keep what gold you may recover. He says that with a little time and patience most anybody can produce, but the most that has been taken out at one time is about \$5.00 worth.

Since the natives can't under present conditions, mine gold at a profit, it seems that they are willing to give it away. As a promotional scheme, this brings much more gold from tourists than is to be found in

all the streams of the neighboring countryside, and with less hard work.

You will drive to Auraria, about four miles south of Dahlonega, and turn off on a red clay road leading up into the hills. It is rough but not too bad when dry. It would be slippery when wet. The miles seem long before you reach the Trammell home.

When you state your wish, Trammell dons rubber boots, gathers up his mining pans and guides you over woods trails up and down hills to a brawling little stream in a hollow.

Here he gets a spade from its hiding place in the bushes and fills the pans with clay from the bed of the stream.

"Now you go to work".

With the pans still in the stream, you plunge in with both hands, break up the clay so the current can carry it away, and toss out the pebbles. It sounds easy but it isn't. It takes a long time and a lot of back breaking work to reduce the contents of the pan to some coarse black sand. If you are lucky you will find a few tiny flecks of gold in the sand. Nearly every panful yields some—not enough to make you rich, but enough so you can truthfully say you have panned gold.

There is much of interest around Dahlonega besides gold and it would be a fine place for a quiet healthful vacation.

The air is invigorating at the altitude of 1,875 feet and even on summer nights one needs a blanket. The Blue Ridge Mountains and the Chattahoochee National Forest are all around with beautiful scenery.

The Smith House, which is famous throughout this section of the state for its fine food, occupies what was originally the office building of a mining company.

However, it has all necessary baths and modern improvements to make it perfectly comfortable.

The dignified courthouse in the square, the oldest one in the state, is of interest to the architect and antiquarian. It was built between 1832-36 and most of the materials used were hauled by ox cart from Augusta.

Whatever your interests, you should be able to find something that appeals to you in Georgia's red clay hills even after you have made your "gold strike."

Dahlonega was adapted from the Indian word, Taulanneka, which means yellow money.

*

PANNING GOLD NOTHING NEW IN GEORGIA.

—It is generally agreed that gold was first mined, if not discovered, in the United States near the early settlement of Dahlonega, Georgia. Some authorities give 1803 and others 1828 as the date of the discovery of gold in the region. The amount of gold received at the United States mint from the entire state of Georgia for the year 1830 was \$212,000; for 1833, \$216,000, and a total of \$744,000 was reported for the four years 1830, 31, 32 and 33. "These mines were found in the tract between the Chattahoochee and the Blue Ridge, where the village of Auraria (from the Latin meaning gold) had recently sprung up, fast becoming a flourishing town."

Quoting from "Bradford's Historical and Commercial Atlas," which we believe to be the earliest literature upon the subject, published in 1835, we learn that:

"In that portion of the gold region of the United States situated within the chartered limits of Georgia, the richest mineral belt, if it may be so termed, is met with in talcose slate and granite formations, alternating with hornblende slate, gneiss and chloride slate; taking a direction nearly N.N.E. and S.S.W. between the Chestatee and Chattahoochee rivers, in Habersham County, near the Cherokee country, it passes the Etowah River, and pursues an unvarying course till we meet it again on the banks of the Cooso River, in the 'Creek' nation in the State of Alabama.

"There are other mineral 'belts' of gold veins and mines running a parallel course at stated intervals and distance from each other, generally from eight to ten miles, and to be met with down towards Augusta, on the Savanna River. These latter cross the Chattahoochee below Col-

umbus. They are terminated, in their nearer approach to the seaboard of the Atlantic, by the disappearance of the primitive formations, which occur a short distance above Augusta. This same position of the rocks occurs a little above Fredericksburg, in Virginia, where the primitive formation also terminates towards the coast. The same geological features are presented as in the neighborhood of Augusta, Georgia.

"The largest amount of gold has been obtained from a class of mines generally known by the name of 'branch mines', or stream mines, situated in the beds of rivers and rivulets and ravines. The capital required to work such mines is small, and the profits almost immediate and daily. A few machines called 'rockers' for washing the gravel strata in which the gold is found, and some Negroes, with the necessary digging tools, are the preparations for opening and profitably working a mine of this nature. Many hundred Negroes are yearly employed in the different States for this purpose, and in general very profitably. It is considered that a mine of ordinary importance will yield one to five dwts. to the hand per day. It is not uncommon to obtain 10 dwts. to the hand, and instances have occurred when as high as 120 dwts. to the hand per day have been obtained."

(dwt.—denarius weight, penny weight. A Troy weight containing 24 gr. or 1/20 of an ounce, originally the weight of a silver penny.)—EDITOR.

Edmond P. Hyatt, M.S., who has contributed several splendid articles upon the subject of Clays to *EARTH SCIENCE*, (See November, 1953; March, 1954) has gained unusual distinction in his collaboration with Paul Dean Proctor and Kenneth C. Bullock, in the preparation of "URANIUM: Where It Is and Where To Find It," which has been pronounced one of the most outstanding publications of its kind since the uranium prospecting craze overtook the country. "It deserves a place in every library with even one item on uranium."

The character of this book is best revealed by a study of the illustrative material, much of which is remarkable. Figure 1, for example, "idealized drawing of a zoned pegmatite." Figure 2, "Apparent zonal relationships of secondary and primary uranium minerals in weathered veins." There are many charts, maps and tables, all exceedingly clear and informative.

Contents include chapters on Economic Uranium Minerals; Types of Uranium Deposits; Where to Find Uranium Deposits (Western United States, Central U. S., Eastern U. S.); Other Sources of Information; Field Equipment; Geiger Counters and U-V Lamps; Field Procedure (walking out the beds, the grid method); How to Locate Your Uranium Claim; Selling Uranium Ores; Uranium Ore-Buying Stations; AEC Depository Libraries; Sending Samples for Assay; Summary.

Lieutenant Wheeler's Ghosts

by RICHARD M. PEARL

SET DEEP in a framework of high-altitude forest land, the Wheeler Pinnacles resemble a strange city on another planet. The agents of erosion must have been in a grotesque mood when they carved these colorful acres of weird rock forms.

Wheeler is a continuous succession of steep winding canyons shutting out all vistas but the sky above, sharply pointed spires and turrets rising from narrow valley floors, pedestals and pinnacles taking on a multitude of odd shapes. Most striking and noted of all are the kneeling ghosts, gathered here in solemn conclave in the heights of the La Garita Mountains, on the edge of the great San Juans.

You cannot drive to the Wheeler Pinnacles. They are accessible only by trails from Wagon Wheel Gap and the storied mining town of Creede, Colorado. These trails lead you, a-foot or on horseback, up slopes carpeted with grasses and wild flowers, and timbered with spruce, nearly to the crest of the Continental Divide. From the edge of Creede an eight-mile trail leads across the face of Mammoth Mountain, presenting an inspiring view of the mining country and the headwaters of the Rio Grande. A branch path crosses the Continental Divide and takes off into the La Garita-Sheep Mountain Wilderness Area, reserved exclusively for those who want



"MEETIN' TIME at Wheeler Pinnacles. The grotesque shapes, like ghosts kneeling at prayer, are called hoodoos."—(Photo U.S. Forest Service.)

to "go primitive" for awhile. The other trail begins three miles out of Wagon Wheel Gap and follows Bellows Creek for six miles.

Then, suddenly, your pleasant hike or ride ceases. You have reached the edge of a maze of almost impenetrable canyons, virtually impossible to make your way through in a direct line, even on foot. Clambering over the broken boulders, wandering at will through the empty "streets," or contemplating at leisure the whims of a Nature that, tongue in cheek, would create so peculiar a place, the visitor, however, has little desire merely to cross the monument area as the crow flies. Leaving that activity to the crow, he prefers instead to let each turn or each climb reveal its new surprises of contour and color.

The ghost-like forms have been sculptured by wind and water acting on volcanic rocks, which compose the landscape for many miles around. During the Tertiary period of geologic history, immediately preceding the glacial age, the entire region was covered by a series of volcanic showers and lava flows, some over a thousand feet thick, of various colors, textures, and composition.

Mountain streams carrying sediment have since cut into the rocks, in many cases following along and enlarging fractures caused by the cooling of the lava, thereby producing interesting valley and canyon networks. Hard winds, laden with sand and dust, blew upon the walls like sand blasts, wearing away the softer and more fragile rock, and leaving strange shapes standing against the sky. Such fantastic natural rock piles are known there as "hoodoos." Buttes and towers with sharp ridges represent what is left of rocky walls. Balanced rocks remain at rest upon pinnacles so narrow that they seem about to drop to the ground, and in time of course they will. Caves, some of them large enough for homes, have been eroded in the cliffs by the wind.

Perhaps first visited — except for rene-

gade Indians who hid in its remote labyrinths — by the John C. Fremont expedition, this was Colorado's first national monument and one of the very earliest to be established in the United States. Owing to its general inaccessibility it was removed from that status in 1950 and returned to the protection of the Rio Grande National Forest. The Pinnacles are named after Lt. George M. Wheeler, who was in charge of the extensive War Department explorations which came to this part of Colorado in 1874 and described its beauties and wonders to the rest of America.

Saddle or pack horses and camping equipment are available at Creede. Spring, shelter cabin, and fenced pasture for horses are provided by the Forest Service, which encourages a two-day camping trip and an overnight stay in order to enjoy the magnificent sunset and sunrise in this recreational and scenic area, so reminiscent of some other world than ours.

HOW TO KNOW THE MINERALS AND ROCKS, by Richard M. Pearl. McGraw-Hill Book Company, Inc. N. Y. \$3.50.

There are perhaps few people better qualified to prepare a book of this type than the author, Richard M. Pearl, of the Department of Geology, Colorado College, Colorado Springs, Colorado.

This work is written in a manner and style which should prove invaluable to the thousands of laymen, who with little educational background in the earth sciences, are striving to make worthwhile collections of minerals and rocks, and to fathom the many intricacies concerning their identity without the tutelage of more formal instruction.

This book is most unique in that on nearly every page one finds a drawing or a diagram applicable to the immediate problem at hand, and in addition there is a set of 46 superb colored pictures illustrating as many minerals which should inspire everyone who sees them to a keener appreciation of the beauties of the mineral kingdom.

Stand-Up Labels For Display Cases

by FRANK L. FLEENER

DISPLAYING MINERALS in glass cases presents some pertinent problems, not the least of which is how to label the specimens so that those viewing them will know their identity and place of origin. In most instances, it has been observed, an attempt has been made to solve this problem by making small labels, which are either propped up against the mineral itself or laid on the shelf nearby. Both of these expedients, while they have their shortcomings, are commendable in preference to using no labels at all, in that they indicate the good intentions of the collector.

from sharing it with others. Therefore, it is reasonable to assume that a well-labeled collection will give more enjoyment to all concerned.

The little stand-up labels suggested in the sketches have been designed primarily to help remedy this situation. They should be cut from a grade of paper that is stiff enough to enable the label to stand where placed, when it is bent into the desired shape. A label laid on the shelf near a specimen may be easily overlooked, or difficult to read. These stand-up labels may be creased and the top bent back so that the

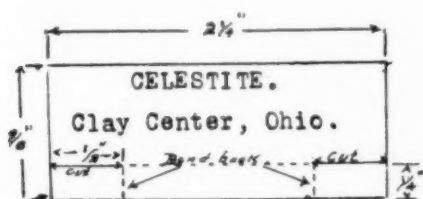


Fig. 1.



Fig. 2.

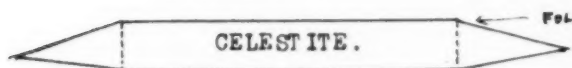


Fig. 3.

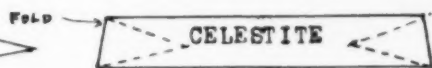


Fig. 4.

Figs. 1. Layout of Stand-Up Label. 2. Rear View of Completed Label. 3.4. Layout of Simpler Form.

It is to be deplored that many fine minerals that are displayed lose most of their educational value for want of labels. It seems to be difficult for some collectors to realize that the acquisition of mineral specimens is not all-sufficient. They seemingly go under the assumption that possession is the all-important point and that labels are a superfluity. They therefore assume that those viewing their collections should know what the minerals are and all about them. This situation seems to be all too prevalent and is quite regrettable. It is a well-known fact that one of the greatest pleasures that the average collector receives from his or her collection comes

incidence of sight of the viewer will be no difficulty in reading the inscription.

The suggested size of the stand-up labels is in no wise an arbitrary matter, but may be easily modified to suit the personal desires of the user. However, the quarter-inch base has been found by experimentation to be the most stable. Uniformity of size will add much to the appearance of the display and should be observed as much as possible.

A variation somewhat simpler and easier to make is shown in Figs. 3 and 4, and consists simply of a narrow rectangular slip of heavy weight paper, with both ends tapered and trimmed with scissors as in-

dicated, and then folded back as wings to support the label in an upright position slightly tilted, for easier reading. In most instances, however, the first described labels are greatly to be preferred.

Labels may be lettered by hand, prefer-

ably with India ink, but lettering also is very easily accomplished on a typewriter. If the blank labels are laid out in the form of a strip, several labels at a time can be typed, cut off, and placed in the display case with a minimum of effort and time.

Iowa's Famous Geode Park

by BEN HUR WILSON

IN PHILLIP'S "MINERALOGY" published in 1828 we read: "A geode is a hollow ball; at Oberstein, in Saxony, are found hollow balls of agate (chalcedony) lined with crystals of quartz or amethyst, which are termed Geodes." Almost one hundred years before, in 1748, John Hill in his "History of Fossils" probably first uses the word in its modern connotation, showing a colored plate with excellent engravings of geodes. While the earliest known mention of the word "geode" dates back to 1619, the term stems from the ancient Greek root *geo*, meaning earth, hence spherical like the earth, ball shaped.

Fifty years ago the word was scarcely known except in regions where they were more or less common and used by early settlers for ornamental purposes, lining walks and flower beds, or in conical piles for "ferneries." Today however, geode is a common and well known term in the vocabulary of all rockhounds, and as objects of interest geodes are much sought after by every ardent collector of minerals. As a matter of fact nature has created few objects in the mineral kingdom more beautiful or intriguing than the finest geodes, or more capable of inspiring awe and wonderment in those of serious mind. As common and simple as their physical appearance may seem, their formation and occurrence poses problems and questions without end.

While geodes may be found in many places throughout the world, and in our own country, the finest beds in the United

States are without doubt in the famous tri-state area of Iowa, Illinois and Missouri, where they may be found in superabundance and variety. In no other place are they so numerous, except perhaps in Russia, where it is said that in the Southern Urals there are also beds of like importance.

The approximate center of the tri-state area, it might be noted, is around Keokuk, Iowa, and its neighboring city of Hamilton across the Mississippi River in Illinois. However, there are many good geode "pickin's" to be found widespread throughout this entire region at the many outcroppings of the geode bearing strata in the beds of almost any small stream or river. This area is irregular in shape, being some 100 miles in length from north to south and in places almost 50 miles in width from east to west.

Iowa's Geode State Park is located on the extreme northern perimeter of this area, and near it is to be found the location which first made these beds famous — the "Lowell Beds," along Skunk (Chiquaqua to the Indians) River near the early settlement of Lowell, which once promised to become a thriving metropolis but today is only a small village. Just a short way below the settlement, at the mouth of Mud Creek, are the famous beds which have produced literally thousands of geodes as fine as any ever found.

Geode Park comprises some 1,628 acres of picturesque hilly country along this creek, purchased by public spirited citizens of the surrounding communities and do-



Above, Scenic Bridge in Geode State Park; center, "Fishing Is Good" at the Park; below, In Saunders park at Nearby Mount Pleasant, Iowa, Footbridge (designed by the author) with Geode Halves.

nated to the State of Iowa for recreational and park purposes. The Commonwealth cooperated by appropriating the money necessary for building a dam creating a 225 acre lake, which is 45 feet deep at the dam-site; and "the fishing is good." Fine shelters and rest rooms were constructed of native stone by federal aid (P.W.A.), one shelter containing one of the largest fireplaces in the country.

The park is located six miles south of New London, Iowa, (the home of Smith's Geode Industries) off U.S. route 34, some 16 miles west of Burlington and 15 miles southeast of Mount Pleasant. Across country it is also about 18 miles northwest of Fort Madison. There are five deposits proper within the confines of the park, and while collecting and removal of geodes from the park area are prohibited, there are plenty of other spots close by where fine specimens may be picked up, and

tourists should not hesitate while crossing the country on route 34, to stop and inquire where to go to collect.

Geodes are to the midwest what thunder-eggs are to the northwestern section of the country, and certainly no one has done more to stir up and revitalize our interest in geodes than the "Smith Family" (father and son), residing at New London, Iowa, the town nearest to the park. The Smiths have successfully turned a rockhound hobby into a thriving industry, rendering a reliable and distinctive service to discriminating collectors throughout the country. They are indeed specialists in their chosen mineral field, and all requests for the rarer types are given careful individual attention. Incidentally, Mr. Smith, whose vocation is banking, always enjoys meeting rockhounds who drop in on him while driving through, and always concludes by advising, "don't forget to visit Geode Park."

"The Band That Ties"

by RUSSELL P. MACFALL

FINGER RINGS have been mankind's favorite ornament and symbol since immemorial times. Although they have been at various times associated with ecclesiastical authority, with mourning and with many fads and fancies, the preeminent interest in rings today is with the engagement and the wedding.

The manufacture of wedding and engagement rings in the United States is big business. It is estimated that there are 1,750,000 weddings a year, and nearly 85 per cent of these will be double ring ceremonies at which both the bride and bridegroom will receive a ring. And only one in five of the brides will not have an engagement ring in addition, either at the time of engagement or later.

Furthermore, at one time brides were happy to have a plain yellow gold band. Now they — and the manufacturers — are

style conscious, and they demand a wide variety of engraved and diamond set rings in gold of several colors.

For this reason, the manufacture starts with the drawing board, where designs for carved, diamond set and plain wedding rings, and for diamond engagement ring mountings are worked out.

In the factory itself, pure gold is melted, alloyed with copper, silver or bronze and cast into bars. The pure gold is too soft for wear, so that most rings are made of 14 karat gold, consisting of 14/24ths gold and 10/24ths of the alloy metal. Silver and copper are the alloys for yellow gold, and with more silver, for green gold. Copper alone as the alloy metal makes a pink-hued gold.

Next the gold bar is rolled several times to make a strip of the right thickness, and is annealed or heated in a furnace at 1,400



A DIAMOND is being marked with ink for cleaving or sawing by an expert lapidary, without whose skill it would remain in appearance like a lump of quartz. He has first studied it and located the grain. After his sawing, rounding, faceting and polishing, is the finished diamond, flawless in cut and color.

degrees to soften the metal for further working. Rolling and annealing close up voids in the cast gold and make it strong and dense for wear resistance.

The strips of gold are next run through stamping presses, where the roughly shaped rings are formed, and through a sizing machine. Carving of designs on the outer surface is done by hand, with an engraving tool, or by chasing the metal with a hammer and small punches. Another machine stamps the karat fineness and trade mark of the maker on the inside.

The often elaborate shapes of engagement rings are formed in a steel die, which presses the gold into the two shanks of the ring. These are then soldered together at the back and in turn soldered to the prongs or box mounting to hold the diamond. Hand engraving is also used to enrich the stamped surfaces.

The cut diamonds, from rough stones dug in Africa and cut in Amsterdam, are a product of high skill. No two rough diamonds are alike in color or in freedom from defects. An expert grades them by color, studies them, and marks in ink on them where they will be sawn or cleaved to make the most perfect and marketable stones. Sawing is done on a thin bronze disk smeared with diamond dust, two days of sawing being required to cut through a one carat diamond. The facets are shaped and polished on a horizontal revolving

wheel impregnated with diamond dust. The perfection of the finished stone depends largely on the high skill of the workman, inasmuch as the tools used are essentially those used for several hundred years.

If several stones are to go into one ring, they must be matched for size and color. The setters then fix the diamonds firmly by working the metal of the prongs around the stone, and the prongs are engraved. The final step in preparing the rings is to polish the mountings on woolen wheels, clean them well with steam, and box them.

The jewelry store is the next stop, and then to the altar.

FRENCH BIBLIOGRAPHICAL DIGEST IN GEOLOGY.

Just published, this third issue of the second series of the French Bibliographical Digest is devoted wholly to geology. Its companion volume dealing with mineralogy, geo-physics and paleontology is now in preparation and will be published in the near future. The "French Bibliographical Digest" is intended primarily to make French scientific work better known in the United States. Libraries, university departments, and research scientists will upon request be placed on the mailing list by the Cultural Division of the French Embassy, 972 Fifth Avenue, New York 21, New York, and will receive, without charge, this and other forthcoming publications. To avoid indiscriminate distribution our correspondents are advised to specify the specific subjects in which they are interested, says Pierre Donzelot, director general in the Ministry of National Education, and permanent representative of French universities in the United States.

Fluorite Holds a Place All Its Own

by BEN E. CLEMENT

FLUORITE, OR FLUORSPAR, is a mineral of great importance in industry. Its crystal forms

and beauty of colors make for enchantment and charm in any mineral collection.

Fluorite is a halogen salt, calcium fluoride, harmless as it is. The element fluorine, At. #9, Atomic Wt. 19, was discovered by Scheele 1771 and isolated by Moissan in 1886. It is a dangerous poison. It is the most active and the most dangerous of the elements. A trace in the air we breathe may mean death. These qualities, however, make it a servant of man. In this Atomic Age it may well be of supreme importance.

Most elements "burn up" in fluorine. It combines in great haste with nearly all the elements and organic compounds. Its attraction for hydrogen in water is so great it pulls away the hydrogen to form hydrofluoric acid. At this point we start with hundreds of world wonders—one of which is the field of atomic energy.

History

The earliest available published records of fluorite and galena in the Illinois-Kentucky district (which is the region of my interest) appeared in the *American Journal of Science* published in 1818, 1820, 1821. Lead ores were known to settlers from about 1812. The first attempt to mine the deposits was made by a company headed by President Andrew Jackson, at the Columbia Mines, Marion, Kentucky, in 1835. (Strange to relate in that year, 1835, the U. S. Government was out of debt and had a surplus of thirty-five million. They had prolonged debate and fuss over what to do with the surplus. It superseded the debate on slavery. Also 1835 was the year of the invention of the 6-shooter by Colt.)

The author of this paper has just been in the office of Pete Davidson, efficient Clerk of the Court, to ask about records of deeds to President Andrew Jackson. He hurried to a rear room and took out some large old books. He showed me twenty-four grantee deeds to President Jackson. There were no typewriters then. It is a work of art in penmanship. Every line so carefully done with a pen is a work of art. The phrasing of the deed, typical of the period, begins, "This indenture made the 13th of March, in the Year of our Lord 1850," etc.

The galena here carries silver and the mines were first opened looking for this precious metal. One of the first and oldest is the Royal Mine or Old Silver, three miles from Smithland, west of and above the Cumberland River. The river and topography there are beautiful. (The writer recalls being with Dr. L. W. Currier, noted geologist from Washington, on a field trip here about 30 years ago. The roads were terrible then, so we hired a boy with a large motor boat to take us on the river to the Old Silver Mines. On the journey the motor stopped on us in the middle of the river. The boy worked for some-



CAVE IN ROCK, on the Ohio River 11 miles from Marion, Kentucky. "It is more than a hundred years since it ceased being a hideout for robbers and pirates. Above the 100 ft. rock wall is now a large Illinois state park. Nearby is the peaceful village of Cave in Rock and a ferry across to Kentucky. A little way north millions of tons of fluorspar have been mined and millions of specimens found of fluorite, zinc, lead, barite, calcite, white quartz, witherite and all possible combinations thereof."

time and could not start the motor again. I was wondering what we would do. Finally the boy started undressing and I wondered what is next. Without a word he put a rope about his neck and shoulders and jumped into the river. He pulled the boat and passengers to their destination.)

year the Memphis Mine opened and its ore was hauled to the Ohio to be shipped by boat. By 1899 some 40 companies had opened to prospect and mine fluorspar.

In Southern Illinois the history of fluorspar is largely the history of Rosiclare. According to Norwood the first discovery of lead in the



"This most excellent fluorite carving was found in May, 1954, by a man with a plow working near Tolu, Kentucky, which is on the Ohio River just across the river from the great Rosiclare, Illinois, fluorspar area. The carving is about 10 in. high, weighs some 18 lbs. Man sits with hands on knees, legs drawn under body. It appears without erosion and like it was carved yesterday. Dr. Glenn A. Black, (Angel Mounds, Newburgh, Indiana), of the Indiana Historical Society, Indianapolis, writes me that the Middle Mississippi Culture, to which this specimen belongs, was at its peak about 1500 A.D. and left these parts about 1600, which indicates the carving is at least 450 years old. Many small carvings have been found in this fluorspar area, this carving just discovered in Kentucky being the largest and best, so far as I know."—Ben E. Clement. (*Courier-Journal* and *Louisville Times* photo by Thomas V. Miller, Jr.)

Galena was first mined and the fluorspar was piled out as waste. The first fluorspar reported shipped from Kentucky came from the Yandell Mine in 1873. It was hauled to the Cumberland in a crude wagon and shipped by boat. The next

Rosiclare district was made in 1839 during the sinking of a well on the farm of James Anderson. This is about a mile SW of the village of Rosiclare on what is now the property of the Aluminum Company.

Early in 1842 William Pell discovered fluor-spar on his farm about 1/2 mile NW of Rosiclare. Galena was the ore sought, as fluor-spar was not then in much use. The lead was smelted at the property—three smelters were built. In 1852 Prof. G. H. Brush visited Rosiclare and obtained samples of galena that ran 4 ounces of silver per ton. Some other areas reported 9 to 20 ounces per ton. The use of fluor-spar started growing and the dumps of fluor-spar started moving until by 1889 or 1890 it was gone. The growth and history of the Rosiclare mine is business romance. For 100 years Rosiclare was the most noted fluor-spar mine in the world. It closed this year. I have lived near by for a third of a century. Its closing after 100 years is to me a sad event. Few Americans realize the omen or the hazard in the chain of events.

Geology

The most widespread fluor-spar deposits of this area are in fissure veins of the Mississippian system. The rocks are therefore sedimentary. The general type of faulting is normal with the hanging wall as the down throw side. The dip may be almost nothing or vertical to as much as 45 degrees. (Davenport Mine, Marion, Ky.) Time of faulting in the fluor-spar area was Post Pennsylvanian and pre-late-Cretaceous (A. H. Sutton). The writer observed, in his years of operation at the Davenport mine, a thrust fault between faults. Displacement may be from a foot or ten feet to as much as 500 ft. or 2,000 ft. in one place. For best ore as well as working conditions we prefer 100 to 500 ft. displacement. On the hills near Marion it is common to see Pottsville (Pennsylvanian) sandstone with the beautiful polished pebbles. The writer has a good collection of a ton or more of coal plant fossils (Lepidodendron, Sigillaria, Calamites, etc.). These are over two hundred million years old. Coal occurs in many of our high hills where caps are Pennsylvanian. One of these specimens we carried out of Panther Hollow near Marion. It is 13" in diameter. It took three men half a day. Another I found under a water tank at a mine used as a support. I was told the original was 12 feet long.

The deposits in the Cave in Rock Area of Illinois are the bedded replacement type. They are chiefly in the St. Genevieve (Fredonia member thereof) and in the upper part of the Renault. The hot fluorine bearing solutions from below entered the formations along the joints and small faults.

It has long been the opinion of geologists that fluorite and other elements of the minerals here came up through dike channels from great depths. Replacement and deposition took place in the faults. The fluorine in solutions combined with the calcium of the calcite giving calcium fluoride. The dikes are the Mica-Peridotite and Pyroxene-Lamprophyre. The dark brown mica and pyrite are easily observed in weathering. The composition of dike material is most interesting but space does not permit detail here.

Fluor-spar has numerous uses. Industries by

the score cannot run at all without it. Iron and steel once consumed the greater part of the tonnage. Steel and iron used 286,099 tons in 1953. Hydrofluoric acid consumed in 1953, 223,360 tons (high grade). Hydrofluoric acid is the starting point to many if not all chemical industries. In this field consumption will grow and grow.

In 1947 total consumption was 376,000 tons, whereas, by 1953 it reached almost 600,000 tons. Consumption will probably reach one million tons per year in a short time.

There is a reason for this increasing demand—any type of steel is made better and quicker with fluor-spar.

What would we do without aluminum? Where would we be in war or peace? One of the classics of industry is the discovery by Hall of how to recover aluminum. Charles Martin Hall was in a chemistry class at Oberlin College. His professor remarked, "A fortune awaits the man who can invent a cheap process for extracting aluminum." In 1886, shortly after graduation, young Hall at 23 solved the problem. The aluminum industry was born. Hall left his Oberlin College three million dollars. Fluor-spar makes possible the electrolytic bath that will free aluminum.

This is why the Aluminum Company of America has great holdings here. The Aluminum Company fluor-spar plant for processing at Rosiclare is one of the finest in the world. The men who work there are fine. I have known many of the personnel for 30 years. Companies like this who carry on research and do big things are the pillars that make America great and strong. Let us not destroy them with socialism or Government control.

One day in 1943, in Washington, we sat behind closed doors (we had all been investigated), at a meeting of our section of the War Production Board. We were advised by the chief of our section that there was a new demand for high grade fluor-spar. This new use was such a guarded secret that the head of our department was told nothing. As I recall the requirement was 25,000 tons. It was after the war that we knew the answer. Fluorine was the essential in the separation of U235 and U238. The great plants at Oak Ridge and Paducah, Kentucky (greatest plants in the world), were made because of dangerous fluorine. The gaseous diffusion process is the only practical method to recover U235. Fluorine is second only to uranium in atomic energy.

We all know that we have arrived at a place and time where atomic energy is first in the survival of this nation. Fluor-spar is first of all a war essential.

Before 1870 mechanical refrigeration was unknown. Ice was cut in winter from lakes, ponds, and rivers, to be stored in pits for summer. In ancient and medieval times snow from mountain tops was carried by fast runners and horse-men to cool the drinks of the wealthy. With the coming of refrigeration from ammonia, etc.,

we thought we had something. We did!

The best was yet to come. About 25 years ago that great house of research, DuPont, gave us Freon 12. What a blessing to mankind. Every ship that has set out to sea and every house that needs an ice box, for a quarter century has known this blessing—a revolution in refrigeration. Freon has no odor. It is not poisonous even

duct "Teflon." It has unbelievable qualities. Gaskets, valves, pump parts, bearings, pipes and machined fittings can operate at temperatures of 500 F and are unaffected by all chemicals normally found in industry. Its high temperature insulation and non-adhesive qualities provide tools for industry and atomic energy heretofore unknown.



Above, BEN E. CLEMENT looking at a pump at the 250 ft. level in the Davenport Mine, Marion, Kentucky, which he operated for 15 years until his retirement in 1945 as president of the National Fluorspar Company. *Below*, minerals in the yard of Mr. Clement's residence on U. S. highway 60 at Marion. "The finer materials of course are inside and fill seven rooms. There are five collections of heavy materials in the yard, most of it museum stuff—quartz, fluorite, zinc, calcite. Note large quartz to right, size about 2 x 3 ft."

20 percent in the air. It is most economical. It does not explode or burn. It does not stop with refrigeration in usefulness. It gives us the useful bug bomb and blessings by the score like the cooling systems needed for penicillin making. Freon is just another product of fluorite.

Another wonder from fluorite, a resin, which belongs to the freon family is the DuPont pro-

Insectides from fluorine salts are known to everyone. It is estimated 4,000 tons of cryolite were used for this purpose in 1943 alone.

There are hundreds of uses for fluorine we must pass over. The above are just a few examples. Much information can be had from Bulletin 76, Ill. Geological Survey, Urbana.

Optical fluorite for making of lens has been

known for decades. The properties that make fluorite valuable for this purpose are its low index of refraction, low dispersion, single refraction and high degree of transparency. Some pieces I have 2" by 2" are marvels of beauty. I have one piece of optical cut as a diamond by a diamond cutter that is "just like a diamond".

We cannot leave this subject (which I have

poorly covered) without a mention of the fluorocarbons—the compounds of carbon and fluorine alone. They are non-inflammable and have extreme stability to heat and chemicals. It is said there are a possible million compounds. There is no end to research and possibility. When fluorine picks up another element it makes a tenacious and stable compound incomparable in the chemical world. Fluorite has a place all its own.



DAVENPORT MINE ore pile, 2,500 tons. "It was pure white after exposure to air. Some came out deep purple and lavender but in the sun it soon turned white. (Energy of sun changed molecular structure of hydrocarbons in small per cent but most uniform in the fluorite.) Strange to say this ore was fluorescent—very strong and striking—either fresh from the mine or after years out."

MIDWEST CLUB NEWS

BERNICE WIENRANK, *Club Editor*
4717 Winthrop Avenue
Chicago 40, Illinois

MINERALOGIST SOCIETY OF JOLIET will mark its twenty-fifth anniversary this year. It is one of the oldest mineral clubs west of the Appalachians.

Mrs. Gladys Babson Hannaford, noted lecturer on the subject of diamonds, spoke before a packed house at the January meeting of MSOJ. Her lecture was illustrated with replicas of the famous diamonds of history and a series of beautiful colored slides and movies.

MICHIGAN MINERALOGICAL SOCIETY was scheduled for February 14 to hear Dr. Steward Faschen of the Bell Telephone Laboratories, speak on "Synthetic Crystal Growth," and to view a film concerning U.S. war time experi-

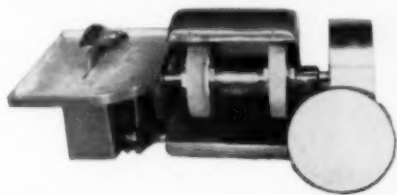
ences in growing and processing ammonium dihydrogen phosphates as a substitute for quartz.

ARKANSAS MINERALOGICAL SOCIETY will hold a Gem & Mineral Show October 7-9 in the Armory at Hot Springs, Arkansas. The exhibit hall in the Armory has 7500 feet of floor space, enough for 100 booths.

Members of AMS are very excited over the numerous uranium strikes recently made in the Little Rock area. Several of the strikes were made by the club's president, Richard Buhlis.

CENTRAL ILLINOIS ROCKHOUNDS planned for February 6 to hear rockologist Brice Kennedy speak on "I Would Like to Interest You in My Hobby."

NEBRASKA MINERAL AND GEM CLUB recently heard the Reverend Lawrence Murphy, who is famed for his alabaster carvings, speak on "Alabaster." He briefly described the various



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stones known as alabaster and said that the common type of alabaster used today is gypsum (hydrous calcium sulphate). The Reverend Murphy uses ordinary carpenter's tools for cutting alabaster and a fine emery cloth for finishing. Commercial manufacturers, he said, use a lacquer finish, rubbed on with a cloth. He illustrated his talk with examples of his own work, including two miniature churches, a model of Mount Vernon, an altar candlestick and a model of the Ark of the Covenant.

CHICAGO ROCKS AND MINERALS SOCIETY marked its 9th anniversary on February 14. Its program for the evening was the showing of a colored film on "Indian Ceremonials," followed by refreshments of coffee and cake.

MINNESOTA MINERAL CLUB will hold its annual exhibit of fossils, minerals and lapidary work on April 17 in Coffman Memorial Union on the campus of the University of Minnesota. Last year the exhibit was attended by nearly 14,000 people.

WISCONSIN GEOLOGICAL SOCIETY heard a well-rounded program presented at its January meeting by five of its junior members. "Mineral Lights," "Fluorescence," "Gem Cutting," and "Uranium" were the subjects covered by the youthful speakers.

EVANSVILLE LAPIDARY SOCIETY celebrated its 2nd anniversary on January 8 with a dinner party. Each member as he entered the banquet hall was given a card which assigned him a mineral name, such as: Mr. Chris C. Cola, Mrs. N. E. Phrite, Mr. J. Asper, etc. He was then instructed to find his place at the banquet table by locating the mineral "named" on his card. Retiring President William Aulsebrook was responsible for the unique place-card idea.

INDIANA GEOLOGY AND GEM SOCIETY on February 11 heard Porter E. Ward lecture on "Constructional and Destructional Cycles of the Mitchell Plain", this being a brief outline of the deposition of the Mississippian limestone in northern Indiana and its subsequent erosion. Following Mr. Ward's talk, pictures of Indiana caves and their beautiful formations were shown.

ISHPEMING ROCK AND MINERAL CLUB on January 26 heard Champ Lemin talk on "The Minnesota Thompsonite Area." An abundance of thompsonite is found on Thompsonite Beach on the north shore of Lake Superior. A few nodules of the mineral are found free on the beach; heavy tools, however, are needed to extract those which have not weathered out.

EARTH SCIENCE CLUB OF NORTHERN ILLINOIS on February 11 heard Roy Beghtal, one of its founders, speak on "The Three Fundamental Laws of Crystallography." They are as follows:

(1) the law of constancy, (2) the law of symmetry, and (3) the law of rational intercepts.

GULF COAST GEM AND MINERAL SOCIETY will be host to the 1955 convention of the Southwest Federation of Mineral Societies, to be held May 6-8 in the Exposition Building, Shoreline Drive, Corpus Christi, Texas. For additional information write: Gulf Coast Gem and Mineral Society, P.O. Box 7525, Corpus Christi, Texas.

NEWS OF OTHER SOCIETIES

OKLAHOMA MINERAL AND GEM SOCIETY'S February meeting was devoted to a general discussion by its membership on agate and petrified wood. On display were agate and petrified wood specimens belonging to members of the club.

MIAMI MINERAL AND GEM SOCIETY is cataloging the mineral specimens permanently displayed in its meeting hall.

SAN ANTONIO ROCK AND LAPIDARY SOCIETY heard Calvin Mansell at its January meeting speak on "Early American Rockhounds". Afterwards Mr. Mansell gave a demonstration of arrowhead-making.

BENICIA ROCK AND GEM CLUB is making plans for its annual Gem Show which will be held in the Veterans Memorial Building, Benicia, California, April 2-3.

COLORADO MINERAL SOCIETY recently heard club prexy, Mike Gunnell, present a talk on "Crystallization of Quartz." A display of quartz crystals was provided by CMS members.

CENTRAL TEXAS GEM AND MINERAL SOCIETY was organized August 9, 1954, with 17 charter members. Its first meeting, held at Brady, Texas, was attended by more than 100 people and was highlighted with an outstanding display of gems and minerals. The club plans to meet at 2:00 P.M. on the last Sunday of each month, in rotation at the following Texas towns: Brownwood, Abilene, Coleman and Brady. Each meeting will feature an exhibit of gems and minerals from the collections of its members.

MINERALOGICAL SOCIETY OF PENNSYLVANIA on January 9 heard Ellen Pietsch discuss the "Fundamentals of Design." Following Miss Pietsch's talk, MSOP members held a workshop session during which they executed their own jewelry designs in silver.

HUMBOLDT GEM AND MINERAL SOCIETY has elected the following officers for 1955: Herbert Glines, president; Mattie Ross, vice president,

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WICHITA GEM AND MINERAL SOCIETY's members are preparing exhibits for the club's annual spring show to be held April 23-24. The location of the show will be announced later.

RECOMMENDED READINGS

"So You'd Rather be Right," by Bertha Minardi, January issue of *Rear Trunk*. A discussion on the pronunciation of mineral names which is sure to cure any inferiority complex that you may have acquired by trying to pronounce the names of some minerals.

"Staurolite", by Joseph Wells, February issue of the *Trilobite*. Mr. Wells avoids being diverted by the legend of the "fairy stones" and proceeds to set forth some scientific facts about the mineral staurolite.

"Faceting is Easy," by Alvin Ericson, January and February issue of *Template*. Mr. Ericson's detailed and well illustrated instructions on faceting are easy to follow.

"Garnet," by Amber Ekberg, January issue of *Chips and Facets*. Includes both scientific data and legends about garnet.

(A mimeographed list of publications will be furnished on request by the Club Editor.)

Uranium Magazine: The Mining Journal of the Atomic Age. Uranium Publications, 601 Ogden Street, Denver 18, Colorado. Monthly. \$3.00 per year.

This new magazine promises to be of unusual interest and value to geologists, earth scientists, and hobbyists, who are (and who are not?) interested in some phase of uranium prospecting, production and/or recovery. Both format and contents are unusually attractive. A complete editorial staff has been set up with Henry W. Hough at the top of the masthead as editor and publisher, and Raymond Hough as business manager. The publishers of EARTH SCIENCE wish them much success in this new undertaking.

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HOW OTHERS SEE US

You won't know it, but any day now one of the cars you pass will be carrying a Rockhound.

You won't recognize him, for he'll look like any other driver at the wheel. (He won't be on a leash, peering out the window, for he isn't that kind of a hound.)

He will be one of several hundred thousands of people whose hobby deals with the earth in general and rocks in particular, in one form or another.

He may be the simple or garden variety of rockhound who is just beginning "to collect pretty stones" (like the ones you might have seen on the what-not in the corner of your grandparents' sitting room).

Maybe he has gone a step further, became interested in fossils and is on his way to a quarry. There he has gained permission to go down after a "shot" has blasted the stone, to look eagerly for trilobites. What are they? You will never see one except in stone, for they were marine creatures some inch or so long that became extinct some millions of years ago.

These rockhounds travel far. This car you pass with a Michigan license may be on the way to South Dakota to collect blue chalcedony (translucent quartz, with a waxlike luster), in the Bad Lands (look out for rattlesnakes!) while that one ahead of you with a North Dakota license may be headed for Florida to pick up geodes (stone nodules with a crystal-lined cavity) from the shores of Tampa Bay.

Vacations over, they settle down to weekend field trips closer home. For instance, to the spoilbank of an exhausted strip mine to search for treasures before nature's green mantle grows back to hide them.

In bad weather and on long winter evenings, each confirmed rockhound has plenty to occupy him.

One may be building a "tumbler" to polish stones for his collection. Another will be eagerly experimenting with a newly purchased drill or power saw. Still another will have become an amateur lapidary, happily engaged in cutting and polishing semi-precious stones for mounting.

Each will go out on an evening now and then to the meeting of one of the local rockhound clubs. Here he may be on the program to discuss, say, "spiral sandstone concretions of the Colorado Delta", or on a committee to set up his club's exhibit for the hobby and gift show at the state capital.

Not a few, with a far away look in the eye, may each be planning to buy or rent a Geiger counter and head out to some wide open spaces to prospect for uranium!

But, really, all you need to start this lifetime enjoyable hobby is the interest, the urge and a prospector's hammer to crack open rocks.—*Safe-Keeping Magazine*.

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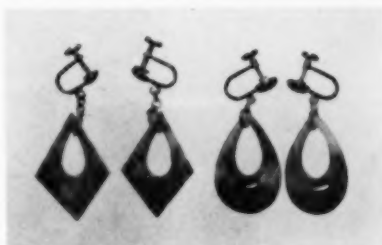
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We are pleased to announce a change in name and location. We bought out THE ORIGINAL CURIO STORE on the main street of downtown Santa Fe. (The oldest in the U.S.—Estab. in 1603.) Part of the Indian jewelry and old pots are being pushed aside to make room for our new PROSPECTORS SHOP where we will continue our old activities on a larger scale. Notices and new lists will go out to all our old friends shortly. Address inquiries to:

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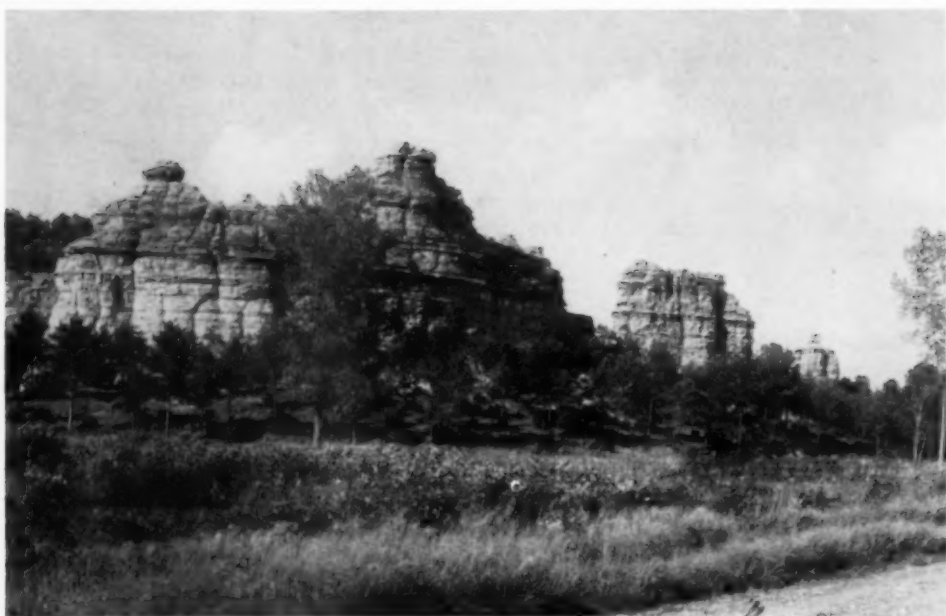
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More recently they became islands in a glacial lake whose waters lapped at their base, leaving their marks now plainly seen. At present they are a noticeable part of a familiar landscape entirely surrounded by dry land far removed from lake or ocean, making a delightful bit of scenery for even the most sophisticated traveler to enjoy.

One year's subscription to **EARTH SCIENCE** will be given to the first individual who mails in the location of this Roadside Beauty Spot.—EDITOR.

PHYSICS—A BASIC SCIENCE. Burns-Verwiebe-Hazel-Van Hooft. D. Van Nostrand Co., Inc., New York. 3d Ed. 1954. 546 pp. \$4.12.

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